

-10-

WE CLAIM:

1. A light source to illuminate a field of interest comprising:
an illumination module capable of projecting illumination light to the field of interest;
a light projector associated with the illumination module
an input device associated with the light projector; the input device capable of sending signals to the light projector such that the light projector simultaneously projects data light along with the illumination light to the field of interest.
2. The light source of claim 1 where the data light displays the location of an instrument relative to a point within the field of interest.
3. The light source of claim 1 wherein the field of interest is a surgical field.
4. The light source of claim 3 that includes a camera system to determine the location of an object within the surgical field.
5. The light source of claim 3 that includes a surface scanning module.
6. The light source of claim 5 wherein the surface scanning module includes a camera system to facilitate video optical scanning and localization of objects based on the scan information.
7. The light source of claim 5 that includes at least one video camera to facilitate video-optical scanning.

-11-

8. The light source of claim 4 where the camera system can detect infrared light from markers placed within the surgical field.

9. The light source of claim 8 where the markers emit infrared light.

10. The light source of claim 8 where the markers reflect infrared light.

11. The light source of claim 3 where the data light displays a surgical target.

12. The light source of claim 11 where the surgical target was determined pre-operatively from a pre-operative scan.

13. The light source of claim 3 where the data light displays a surgical approach.

14. The light source of claim 13 where the data light displays information about the location of an instrument relative to the surgical approach.

15. The light source of claim 3 where the data light displays anatomical structures.

16. The light source of claim 3 where the data light displays physiological data.

17. The light source of claim 16 where the physiological data includes at least one of blood flow, blood pressure, electrical fields, metabolism, electrolyte levels, respiration rate, pulse rate, or temperature

-12-

18. The light source of claim 3 where the data light displays physiological activity.
19. The light source of claim 3 where the data light displays information relating to life support systems and parameters
20. The light source of claim 3 where the data light displays the progress of the surgical procedure.
21. The light source of claim 3 where the data light displays the data relative to attainment of a surgical goal.
22. The light source of claim 3 where the data light displays reference information.
23. The light source of claim 3 where the data light automatically updates the displays based on the position of the instrument within the surgical field.
24. The light source of claim 1 where the data light is displayed using digital light projection.
25. The light source of claim 3 where the data light displays data from a surgical navigation system.

-13-

26. The light source of claim 3 where the data light displays information specific to a particular surgical instrument being used.

27. The light source of claim 1 where the data light displays information in a three dimensional form.

28. The light source of claim 1 where the light projector comprises a matrix of light projection devices.

29. The light source of claim 28 where the light projector is capable of projecting colored light.

30. The light source of claim 1 that includes an adjustable support structure.

31. The light source of claim 30 where the support structure is remotely controlled.

32. The light source of claim 30 where the support structure is adapted automatically to achieve best line of sight or perpendicular light projection rays.

33. The light source of claim 1 wherein the data light is projected directly onto a surgical field.

34. The light source of claim 1 wherein the data light is projected onto a reflective surface associated with a surgical field.

-14-

35. The light source of claim 1 wherein visual information delivered by the data light is manipulated to conform to the shape of the surface onto which the visual information is projected.

36. The light source of claim 35 wherein the visual information is manipulated to conform to changes made to the surface onto which the visual information is projected.

37. The light source of claim 35 wherein the data light is calibrated by stereophotogrammetry using a calibration pattern.

38. The light source of claim 1 where the input device is a computer.

39. The light source of claim 38 where the computer is connected to a network.

40. The light source of claim 1 where the light source has control code and the code is upgradeable.

41. A light source to illuminate a field of interest comprising:
an illumination module comprising a series of digital light projectors capable of projecting illumination light to the field of interest;
an input device associated with the illumination module; the input device capable of sending signals to the illumination module such that the illumination module simultaneously projects data light along with the illumination light to the field of interest.
42. The light source of claim 41 where the field of interest is a surgical field.
43. The light source of claim 42 that includes a camera system to determine the location of an object within the surgical field.
44. The light source of claim 42 where the data light displays a surgical target.
45. The light source of claim 43 where the data light displays data from a surgical navigation system.
46. The light source of claim 42 where the light projector comprises a matrix of light projection devices.
47. The light source of claim 41 where the data light displays information in a three dimensional form.
48. The light source of claim 41 wherein visual information delivered by the data light is manipulated to conform to the shape of the surface onto which the visual information is projected.
49. The light source of claim 48 wherein the visual information is manipulated to conform to changes made to the surface onto which the visual information is projected.

-16-

50. The light source of claim 48 wherein the data light is calibrated by stereophotogrammetry using a calibration pattern.

51. The light source of claim 41 wherein the light source is automatically moved to optimize the line of sight or the projection of the light.

-17-

52. A method of providing light to a field of interest comprising the steps of:
projecting illumination light from an illumination module;
projecting data from a light projection module associated with the illumination module; and
capturing surface data from within the field of interest.

53. The method of claim 52 that includes the step of registering the surface data to the data projected from the light projection module.

54. The method of claim 52 that includes the step of tracking the location of the surface data.

55. The method of claim 52 that includes the step of updating the projected data.

56. The method of claim 52 wherein the light projection module is integral with the illumination module.

57. The method of claim 52 wherein the data is projected on the field of interest.

58. The method of claim 52 wherein the field of interest is a surgical site.

59. The method of claim 58 that includes the steps of modifying the data projected based on detection of a surgical instrument.

60. The method of claim 58 that includes the step of indicating the direction to move an instrument using the projected data.

-18-

61. The method of claim 52 that includes the step of adjusting the illumination light and the data light to optimize the line of sight or the projection of the illumination light or the data light.

62. The method of claim 52 that includes the step of calibrating the data projection using stereophotogrammetry.